

# Accidental intakes of remedies from complementary and alternative medicine in children—analysis of data from the Swiss Toxicological Information Centre

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**Abstract** The use of complementary and alternative medicine (CAM) in Switzerland is rather high, and therefore, the occurrence of accidental intakes of CAM remedies by children and associated intoxications is to be expected. In the present study, the inquiries to the Swiss Toxicological Information Centre that took place from 1998 until 2007 and concerned accidental, unintended intakes of CAM remedies by children were analysed. Inquiries for information were performed by concerned care-givers, physicians, pharmacists and others in case of acute accidental intake of CAM remedies. Feedbacks from physicians about paediatric patients with acute intoxication possibly associated with the accidental ingestion of CAM remedies were as well considered. During the study period, 3,158 accidental intakes of CAM remedies (1,015 of herbal and 2,143 of homeopathic remedies) were reported, corresponding to 8.6% of all reported accidental intakes of pharmaceutical

products by children. No significant increase of the yearly number of accidental intakes of CAM remedies was detected during the study period. There was no accidental intake of CAM remedies leading to severe signs or symptoms. Concerning the herbal remedies, three intoxications of moderate and 28 of minor severity were reported. Nine children with intoxication from homeopathic remedies were reported, with minor symptoms only. All other accidental intakes of CAM remedies did not lead to intoxications and evolved without manifestations. The data show that accidental, unintended intake of CAM remedies happened in children, but developed mostly harmlessly. Comparing herbal with homeopathic remedies, accidental intakes with homeopathic remedies were more common, but intoxications associated with manifestations were observed more frequently with herbal remedies.

**Keywords** Complementary and alternative medicine · Intoxication · Homeopathy · Herbal · Children · Accidental intakes

## Abbreviations

CAM Complementary and alternative medicine  
STIC Swiss Toxicological Information Centre  
TOXI In-house computer-based and structured data recording and analysis system

## Introduction

Complementary and alternative medicine (CAM) includes practises that are not an integral part of the conventional health care system, but are used by many patients to supplement their health care. Several surveys have indicat-

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ed that the use of CAM has been increasing during the last decades. For instance, the use of herbal remedies by US citizens increased approximately 400% between 1990 and 1997 [5]. More and more physicians are referring patients to herbal practitioners or practising phytotherapy themselves [1]. Although there is a general belief that CAM remedies are safer than conventional ones, adverse events have been reported for several CAM therapies [8, 10]. Furthermore, traditional medicines containing toxic heavy metals or undeclared prescription drugs have been described [9], and several interactions between CAM and conventional remedies have been reported [6, 16]. Case series concerning liver problems following the repeated use of Chinese herbal medicines for skin disorders, allergic reactions to royal jelly and propolis, as well as heavy metal poisoning caused by remedies from the Indian subcontinent have been described [20].

The use of CAM by children is still probably less common than by adult patients but has been increasing as well recently [3, 19]. A recent study from Germany showed that 35% of paediatric oncology patients used some form of CAM [15]. Our previous work revealed that the majority (58%, 665 out of 1,143) of the patients presenting to an urban, tertiary paediatric emergency department in the German-speaking Switzerland had used some form of CAM therapies [23]; worryingly, 50% of all respondents used CAM as self-medication, and half of the families that used CAM did not even discuss this with their general practitioner.

Intoxications with (conventional) medicaments correspond to 25–30% of the poisonings occurring among children [13, 22]. The information on drug poisoning of children with CAM remedies is still scarce. The present study describes well-documented cases of accidental, unintended intakes of CAM remedies by children (<16 years old) and associated intoxications reported to the Swiss Toxicological Information Centre (STIC) between January 1998 and December 2007. The impact of the data on the perception of CAM remedy safety is discussed.

## Patients and methods

The STIC is contacted by physicians, pharmacists and laypersons concerned about accidental intakes of various substances to enquire on the risk of probable toxicity. Furthermore, the STIC collects detailed clinical reports from physicians and hospitals treating patients with intoxications through an in-house computer-based and structured data recording and analysis system (TOXI [11]).

A search of the TOXI database revealed all calls related to CAM in the years 1998–2007. Database information on each and every case was verified by comparing it with archived original reports and supplemented by information

from discharge letters and laboratory reports, when available. Assessment of causality included an appropriated temporal relationship between drug ingestion and toxic reaction and the absence of other drugs or diseases that could explain the signs and symptoms [12, 14]. Patients with intended intake of pharmaceutical product were excluded. Intoxications were graduated according to a poisoning severity score [18]. Data were analysed using SPSS for Windows version 14 (SPSS Inc., Chicago, IL, USA). Medians are reported in those cases in which the distributions were skewed.

## Results

### Acute accidental intakes of CAM remedies by children between 1998 and 2007

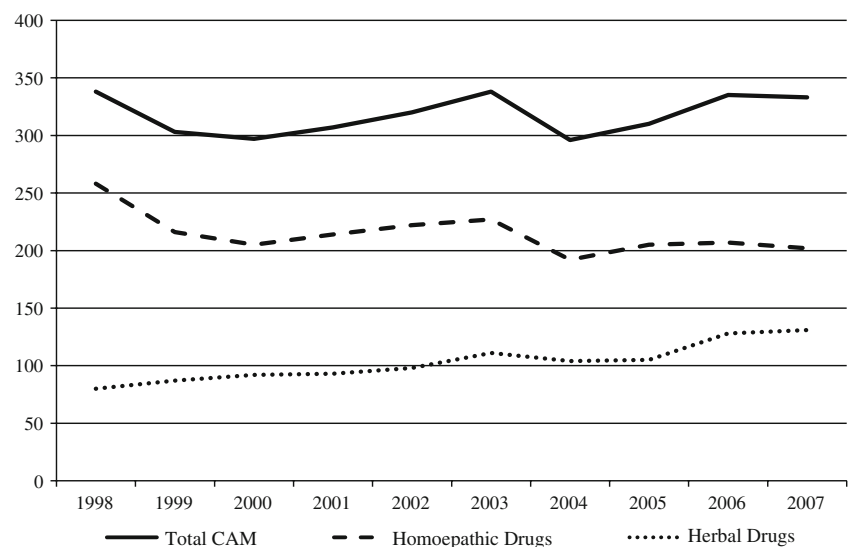
Between January 1998 and December 2007 a total of 127,815 cases (median 12,494 per year) of accidental intake of possibly dangerous substances by children were reported to the STIC, 36,889 (29%) concerning intakes of pharmaceutical products [21]. Of these, 3,158 (8.6%) cases consisted of acute accidental intakes with CAM, 1,015 (32%) with herbal and 2,143 (68%) with homeopathic remedies. Most (2,673, 84%) cases were reported by public (797 with herbal and 1,876 with homeopathic remedies), 280 (9%) by attending physicians (133 and 147), 129 (4.1%) by practising physicians (53 and 76), 37 (1.2%) by pharmacists (17 and 20) and 39 (1.2%) by others (15 and 24, respectively).

During the study period the median number of cases per year was 315 (105 with herbal and 210 with homeopathic remedies), with a maximum of 338 in the year 1998 (80 and 258) and a minimum of 297 in the year 2000 (92 and 205, respectively; Fig. 1). No significant increase of registered patients was found during the decade covered by this study (Pearson's correlation coefficient,  $r=0.244$ ). The accidental intakes of herbal and homeopathic remedies, which led to manifestations, are depicted in Tables 1 and 2, respectively. The ranking of the most frequent remedies is presented in Table 3, split into herbal and homeopathic remedies. Most of the children with accidental intake of CAM remedies were 2–3 years old (Fig. 2).

### Drug intoxications with herbal remedies

Seventy-one (2.2%) cases of intoxications upon herbal remedies led to a follow-up by a health care professional and were well documented. Forty thereof (56.3%) occurred without manifestations, 28 (39.4%) were associated with minor and three (4.2%) with moderate symptoms. The number of patient with intoxications with herbal remedies

**Fig. 1** Registered children with accidental intakes of CAM remedies between 1998 and 2007, according to year



according to the age is depicted in Fig. 3. A peak could be found at the age of 2 to 3 years, coinciding with highest frequency of accidental intakes (Fig. 2).

Patient's data, remedies, application and signs of these symptomatic intoxications were analysed (Table 1). In brief, 19 were registered with ingestion of remedies containing essential oils. Thereof, five intoxications were caused by Japanese essential mint oil (nos. 1, 4, 8, 17 and 24), two by Chinese healing oil (nos. 11 and 16), two by essential oils of tea tree (nos. 2 and 12), seven by a cream or bath for relief of catarrh (nos. 5, 13, 23, 25, 26, 30 and 31), one by liquid for relief of catarrh (no. 14), one by grapefruit oil (no. 21) and one by plantago cough mixture (no. 28). Four patients concerned ingestion of spagyric remedies (nos. 3, 10, 22 and 27). Three cases (nos. 6, 9 and 20) concerned ingestion of calendula baby powder (*Calendula officinalis*, talc). Two cases (nos. 7 and 29) contained ingestion of fennel tea. Furthermore, there were three single patients with minor manifestations upon ingestion of spirit of camphor (no. 15), drug extract of *Eschscholzia* and passion flower (no. 18) and uzara root extract (no. 19).

#### Drug intoxications with homeopathic remedies

During the period covered by the present study, there were 23 well-documented cases of accidental ingestion of homeopathic remedies, with follow-up information given by health care professionals. Thereof, 14 cases developed no symptoms and nine minor symptoms. The distribution of the intoxications among the various age groups is presented in Fig. 3. In contrast to the profile obtained in the case of accidental intakes (Fig. 2), no peak could be found concerning the ages of patients with intoxication upon accidental ingestion of homeopathic remedies (Fig. 3).

Patient's data, remedies, application and symptoms of these symptomatic intoxications were analysed (Table 2). In three cases, ingestions of mother tinctures had occurred: *C. officinalis* mother tincture (nos. 1 and 2) and thujone mother tincture (no. 9).

Two patients (nos. 5 and 6) ingested camomile globules. Furthermore, there were single patients with ingestion of pearl tablets (case no. 3), globules for colds (no. 4) and Bach flowers rescue drops (no. 7). Finally, an application of ear drops into the eyes was registered (no. 8).

#### Discussion

A total of 3,158 cases of accidental intakes of CAM remedies were reported, corresponding to 8.6% of all reported accidental intakes of pharmaceutical products by this population during the study period. Although this absolute number of accidental intake of CAM remedies by children is considerable, it corresponds to a minority of the overall accidental intakes with pharmaceutical products. This is particularly striking, if one bears in mind that the use of CAM therapies is rather high in Switzerland. Our recent work showed that 58% of the paediatric patients presenting to a paediatric emergency department in the German-speaking Switzerland had already used some form of CAM therapy. The same survey revealed that nearly two thirds of the administered CAM therapies were due to self-medication, suggesting that CAM remedies might be often present in Swiss households and easily available to the overall population in general and to children in particular. Although several studies concluded that the use of CAM is increasing, our results show a stagnation of accidental intakes of these remedies. The reason for this inconsistency remains unclear. Probably because of the long tradition of

**Table 1** Intoxications with herbal remedies reported to the STIC between January 1998 and December 2007

Case	Age	Sex	Remedy	Ingredient/concentration (when available)	Form of accidental intake	Amount	Case history/signs or symptoms	Severity score	Association/comments
1	0.5	M	Japanese healing essential oil	Japanese essential mint oil	Oral/cutaneous/eyes	n.s.	Administered by the elderly sister/primarily cyanotic with foam out of mouth; later oral bland, cornea lesion of the eye	Moderate	Likely/essential oils may cause lesion of the cornea
2	1.6	F	Tea tree oil	Essential oils of tea tree	Oral	10–15 ml	Problem with balance, ataxia, confusion, agitation	Moderate	Likely
3	4.5	F	Spagyric remedy, n.s.	Thujone, ethanol	Oral	50 ml	Agitation, problems with balance, slowed reactions	Moderate	Likely/due to ethanol
4	0	F	Japanese healing essential oil	Japanese essential mint oil	Oral	4 drops	Crying, increased salivation, hypotonic, apathetic	Minor	Likely
5	0.8	F	Cream for relief of catarrh	Camphor, Peru balsam, essential oil of eucalyptus and rosemary	Oral	n.s.	Emesis	Minor	Likely
6	1	M	Calendula baby powder	Calendula, talc	Inhaled	Few	Cough	Minor	Likely
7	1.3	F	Fennel tea, instant no sugar added, granulated	Fennel extract	Oral	n.s.	Put too much into the cup/emesis for 1 h	Minor	Likely
8	2	F	Japanese healing essential oil	Japanese essential mint oil	Eyes	Few	Elevated lacrimation	Minor	Likely
9	2	F	Calendula baby powder	Calendula, talc	Oral/inhaled	n.s.	Emesis during 4 h	Minor	Likely
10	2	F	Spagyric remedy, n.s.	Propolis, belladonna, <i>Tropaeolum majus</i> , ethanol	Oral	n.s.	The product was given by the elderly sister/emesis, fatigue	Minor	Likely/due to ethanol
11	2	F	Chinese healing oil	Chinese essential mint oil	Oral/cutaneous	2 ml	Flush of face and eyes	Minor	Likely
12	2	n.s.	Tea tree oil	Essential oils of tea tree	Oral	n.s.	Emesis	Minor	Likely
13	2	M	Cream for relief of catarrh	Essential oils, camphor	Oral	n.s.	Burning of the mouth	Minor	Likely
14	2	M	Liquid for relief of catarrh	Essential oils of mint, eucalyptus, juniper, sage, 7% alcohol	Oral/cutaneous/eyes	30 ml	Burning of the mouth and eyes, redness of skin of face	Minor	Likely
15	2	M	Camphor spirit	Camphor, ethanol	Oral	1 gulp	Somnolence	Minor	Likely
16	2	M	Chinese healing oil	Essential mint oil	Oral	n.s.	Emesis	Minor	Likely
17	2	F	Japanese healing essential oil	Japanese essential mint oil	Oral	Few	Redness of skin of face	Minor	Likely
18	2	M	Tablets for promoting sleep	Dry extract of <i>Eschscholzia</i> and passion flowers	Oral	n.s.	Fatigue	Minor	Likely
19	2.2	F	Uzara root extract	Extract of milkweeds roots, ethanol	Oral	n.s.	Somnolence	Minor	Likely/due to ethanol
20	2.5	n.s.	Calendula baby powder	Calendula, talc	Oral/inhaled	n.s.	Cough	Minor	Likely
21	3	M	Grapefruit oil	Grapefruit oil	Oral/cutaneous	0–10 ml	Thoracic pain	Minor	Likely
22	3	F	Spagyric remedy, n.s.	Ethanol 40%	Oral	8 ml	Somnolence	Minor	Likely/due to ethanol
23	3.5	F	Cold and bronchial bath	Oil of thyme, spruce, eucalyptus, rosemary, lavender	Oral	10 ml	Cough	Minor	Likely
24	3.6	F	Japanese healing essential oil	Japanese essential mint oil	Oral/cutaneous/eyes	n.s.	Redness of eyes and face, swelling of eyelid, bronchospasm	Minor	Likely
25	4	M	Cream for relief of catarrh	Essential oils, camphor, etc.	Eyes	A little	Slight redness of eyes	Minor	Likely
26	4	M	Cold and bronchial Bath	Oil of thyme, spruce, eucalyptus, rosemary, lavender	Oral	150 ml	Emesis, ataxia, somnolence	Minor	Likely/due to ethanol

27	4	F	Spagyric remedy, n.s.	Ethanol 22%	Oral	Up to 1 dl	Emesis, somnolence	Minor	Likely/partially due to ethanol
28	4.5	n.s.	Plantago cough mixture	Essential oils, resin	Oral	n.s.	Emesis, large erythema on whole body	Minor	Likely
29	5.2	F	Instant tea for children, with glucose, granulated	Extract of camomile, yarrow, fennel, orange, liquorice, glucose	Oral	200 g	Gastrointestinal symptoms, urticaria	Minor	Likely
30	7	M	Cold and bronchial bath	Oil of thyme, spruce, eucalyptus, rosemary, lavender	Oral	15 ml	Emesis	Minor	Likely
31	15	M	Cold and bronchial bath	Oil of thyme, spruce, eucalyptus, rosemary, lavender	Oral	30 ml	Emesis, retrosternal pain, somnolence	Minor	Likely

Forty children with accidental intake without signs or symptoms were excluded. Twenty-eight patients had minor signs or symptoms, while three patients had moderate signs or symptoms. There was no intoxication with a severe symptoms score

n.s. not specified

**Table 2** Intoxications with homeopathic remedies reported to the STIC between January 1998 and December 2007

Case	Age	Sex	Remedy	Ingredient/concentration (when available)	Form of accidental intake	Amount	Case history/signs or symptoms	Severity score	Association/comments
1	0.1	M	<i>Calendula officinalis</i> mother tincture	Calendula, ethanol 40–60%	Oral	1 gulp	Sneezing, rhinitis	Minor	Likely/due to ethanol
2	0.1	F	<i>Calendula officinalis</i> mother tincture	Calendula, ethanol 40–60%	Oral	Up to 15 ml	Administered by a nurse; slight lethargy 10 min after intake	Minor	Likely/due to ethanol
3	2	M	Pearl tablets	<i>Mater perlarum</i> D4	Oral	12 tablets	Emesis	Minor	Likely
4	3	W	Homeopathic remedy for colds, drops	<i>Allium cepa</i> D4–D15, ethanol 52%	Oral	ca. 19 ml	Euphoria	Minor	Likely/due to ethanol
5	3	F	Chamomile globules	Chamomile, n.s.	Oral	20 globules	Abdominal pain, flatulence	Minor	Likely/due to sugar substitute
6	4.5	M	Chamomile globules	Chamomile, n.s.	Oral	n.s.	Emesis	Minor	Likely
7	4.8	M	Bach flower rescue drops	Ethanol 36%	Oral	30 ml	Problem with balance, somnolence	Minor	Likely/due to ethanol
8	5	M	Homeopathic ear drops	<i>Chamomilla</i> D10, <i>Mercurius</i> D15, sulphur D12, glycerine 90%	Eyes	1 drop	Pain	Minor	Likely
9	10	F	Thujas mother tincture	Thujone	Oral	5 drops	Burning lips, nausea, emesis	Minor	Likely

Fourteen children with accidental intake without signs or symptoms were excluded. Nine patients had minor signs or symptoms. There was no intoxication with a moderate or severe symptoms score

n.s. not specified

**Table 3** Ranking of the accidental intakes of herbal and homeopathic remedies reported between 1998 and 2007 by frequency

Ranking	Herbal remedies	Number	Homeopathic remedies	Number
1	Cold and bronchial cream or bath	210	Arnica, n.s.	199
2	Spagyrik, n.s.	62	Globules for sleep disturbances	129
3	<i>Echinacea</i> , n.s.	59	Remedy for cough, globules	117
4	Tea tree oil	49	<i>Echinacea</i> , globules	85
5	Japanese essential mint oil	43	Remedy for colds, drops	73
6	Cough syrup for children	43	Schüssler salts, tablets	53
7	Chinese healing oil	24	Remedy for fever and flu, globules	47
8	Dragées against sinusitis	20	Belladonna preparation, n.s.	42
9	<i>Capsicum annuum</i> , extract	17	Bach flowers globules, n.s.	37
10	St. John's wort, dragées	17	Remedy for disorders of liver and bile	27
11	Arnica ointment	16	<i>Apis mellifica</i> globules D12	24
12	Calendula baby powder	15	Spray for insect bites	23

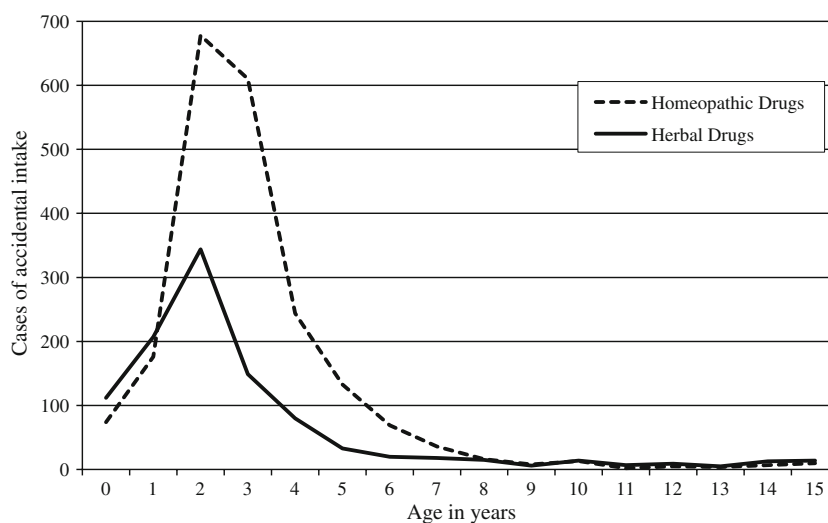
Drug names were presented such as originally reported. All reported accidental intakes were considered, also those without signs or symptoms  
n.s. not specified

CAM in Switzerland no increase in the study period occurred, in contrast to other countries in which popularity of CAM increased recently, such as the USA [5]. The results show further that intoxications upon accidental intakes of CAM remedies were however rare and led to only minor (37 cases) or moderate (three cases) signs or symptoms; no case leading to severe symptoms was reported.

The two big groups of CAM remedies mentioned in the enquiries to the STIC were herbal and homeopathic remedies. From the 1,051 cases of accidental intakes of herbal remedies reported during the period covered by this study, only 28 were of minor and three of moderate severity. Half of all intoxications with herbal remedies described in this investigation contained oil of either mint or eucalyptus. Eucalyptus oil, available in a variety of formulations, is commonly used in vaporisers and steam baths, for symptomatic relief in upper respiratory tract

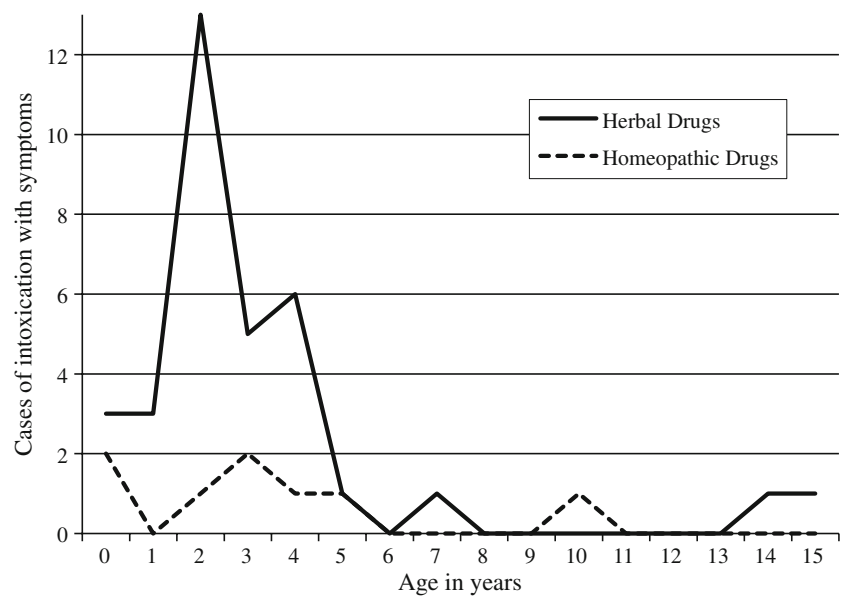
infections. The toxicity of such products in young children has been well documented. Based upon searches in four Australian databases, it has been estimated that eucalyptus oil was a leading cause of hospital admission upon childhood poisoning in Victoria, Australia [17]. In our investigation however, intoxications with oil of eucalyptus caused only minor symptoms. In contrast, there were intoxications with oil of mint with moderate symptoms, although adverse effects of this remedy are rather unknown.

Spagyric is the name given to a particular type of production of herbal remedies by fermentation, distillation and extraction of mineral components from the ash of the plants. Four cases of accidental intakes of spagyric remedies associated with signs or symptoms were registered during the study period, one of moderate severity; all symptoms may have been caused by the alcohol contained in the remedies.

**Fig. 2** Accidental intakes of CAM remedies by children, according to their age



**Fig. 3** Intoxications of children upon accidental ingestion of CAM remedies, according to their age



Homeopathy is a popular form of CAM, being integrated in the official health care systems in several countries. Homeopathic remedies are available either with a single or with multiple components, and their production often begins with a “mother tincture”—in the case of soluble substances—and proceeds through a process known as “potentiation”, a serial dilution with shaking (succussion). The dilution steps lead to extremely low amounts of the original substances still present in the commonly used homeopathic remedies. While it is often assumed that homeopathy is free of risks [4], some side effects and complications have been reported in the literature, due to contamination with heavy metals, carcinogen remedies or allergic reactions [7]. Our work shows that intoxications are extremely seldom upon accidental intakes of homeopathic remedies, but do exist. The symptoms were of minor severity and mostly due to the alcohol present in the remedies. Three out of the nine reported cases were observed upon ingestion of the mother tincture, i.e. without the characteristic serial dilution of the homeopathic remedies.

The amounts of pharmaceutical products, which are ingested during accidental intakes, are obviously distinct from—often much higher than—their recommended therapeutic dose. Nevertheless, it is interesting to reflect about their health effects in view of the expected side effects of these products at therapeutic dose. From the 3,158 cases of accidental intakes of CAM remedies reported during the period covered in the present study, not a single one was associated with severe signs or symptoms. The data further show that only 93 (2.9%) accidental intakes led to a follow-up by a physician, thereof 53 (57%) developed without symptoms, 37

(39.4%) were of minor and three (3.2%) of moderate severity. This is in contrast to previous cases series or case reports, where various examples of liver, kidney or other organ damage have been reported upon treatment with (mostly herbal) remedies contaminated for example with heavy metals or adulterated with synthetic compounds [9, 10]. Most of those cases [10], however, had a geographic location rather distant from the country where the data described in the present study were harvested, which may suggest that in the different geographic locations, products are available with different quality standards. In some countries, herbal remedies are not submitted to stringent regulation and control, which might explain several reports of contaminated (e.g. with heavy metals) or adulterated (e.g. with prescription drugs) herbal remedies. In addition to these contamination problems, herbal remedies might be particularly problematic since they contain a range of pharmacologically active constituents, and users of herbal remedies often combine herbal remedies with prescribed drugs allowing for possible herb–drug interactions.

A major limitation of the present study is that the threshold to communicate accidental intakes of CAM remedies might be lower than that of pharmaceutical products from the conventional medicine, due to the widespread belief that CAM remedies have very little or no side effects [2]. Another possible limitation is a deficient classification as herbal or as homeopathic remedy (herbal medicines identified as homeopathic or vice versa) due to the lack of knowledge on these products.

**Competing interests** The authors declare that they have no competing interests.

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